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A new species and a new variety of *Turpinia (Staphyleaceae)* from Borneo

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Summary. *Turpinia calciphila*, so far known only from limestone hills in Sarawak, and *T. sphaerocarpa* var. *microcerotis*, recorded in Sabah and Kalimantan, are described. Keys to the species occurring in Borneo are provided.

The Staphyleaceae is a smallish plant family in the Old and New Worlds. Only one of five genera of this family occurs in Borneo. The name *Turpinia* Vent. (1807) was conserved against *Triceros* Lour. (1790) mainly because it represents a widespread genus in the Old and New World tropics (with a large number of species epithets attributed to this name) and it has been widely used in scientific publications (van den Brink, van der Linden & van Steenis 1960).

In revising the family for Malesia, van der Linden (1960) recorded five species of *Turpinia* in Borneo, *viz.*, *T. borneensis* (Merr. & Perry) v.d. Linden, *T. grandis* v.d. Linden, *T. nitida* Merr. & Perry, *T. sphaerocarpa* Hassk. and *T. stipulacea* v.d. Linden. All five species occur in Sabah but only two (*T. grandis* and *T. sphaerocarpa*) are found in Sarawak. The record of *T. borneensis* in Mt. Santubong in Sarawak by Anderson (1980) is based on a misidentification. Apparently, both *T. nitida* and *T. stipulacea* are endemic to Sabah. They are normally found on hilly ridges near streams or montane forest to *c.* 2000 m, and are common along trails on Mt. Kinabalu.

During a revision of the genus for the Tree Flora of Sabah and Sarawak, a new species and a new variety of *T. sphaerocarpa* have been recognised. The new species, *T. calciphila,* is known only from limestone hills and cliffs to *c.* 900 m in Sarawak, whereas the new variety, *T. sphaerocarpa* var. *microcerotis,* appears to occur from the lowlands to montane forest up to *c.* 1500 m, in Sabah and Kalimantan.

The characters which distinguish *T. calciphila* and *T. sphaerocarpa* var. *microcerotis* from other taxa in Borneo are summarised in the two keys provided below.

Key to *Turpinia* species in Borneo

(based mainly on vegetative characters)

1a. Stipules large (14–25 mm long), conspicuous and persistent on apices of leafy twigs ..... *T. stipulacea*

1b. Stipules much smaller (not exceeding 10 mm long), not very conspicuous, falling off early from leafy twigs.

2a. Lower surface of leaflets sparsely to densely short-hairy on the midrib, lateral veins and blade.

3a. Leaves 5–7–9-foliolate. (Plants of limestone habitats.) ..... *Turpinia* sp. 1 (one sterile specimen known: *Kostermans* 13449A, E. Borneo, Mt. Medadam, north of Sangkulirang, 100 m alt., limestone)

3b. Leaves unifoliolate to trifoliolate. (Plants of non-limestone habitats.) ..... *T. grandis*

2b. Lower surface of leaflets completely glabrous.

4a. Intercostal veins pseudoscalariform (with many almost straight cross-veins between the lateral veins) ..... *T. sphaerocarpa* var. *sphaerocarpa* (in part)

4b. Intercostal veins reticulate (with wide areoles, or obscurely or distinctly tessellate, with no or very few straight cross-veins between the lateral veins).

5a. Leaflets thickly coriaceous, margin strongly recurved when dry ..... *T. nitida*

5b. Leaflets chartaceous or coriaceous, margins not strongly recurved when dry.

6a. Leaflets narrowly acuminate to caudate, acumen usually 1–2 cm .... *T. borneensis*

6b. Leaflets shortly acuminate to cuspidate, acumen to *c.* 1 cm long, often shorter.

7a. Leaves 20–46 cm long (rachis 10–18 cm long) .... *T. sphaerocarpa* var. *sphaerocarpa* (in part)

7b. Leaves often less than 20 cm long (rachis less than 10 cm long).

8a. Stipules small, 2.5–3.5 mm x 2–2.5 mm. Leaflets coriaceous and slightly shiny on lower or both surfaces. Fruit globose to subglobose, without short apical horns, but with radial lines at the apex. (Plants restricted to limestone.) .... *T. calciphila*, sp. nov.

8b. Stipules larger, 5–7 mm x 3–4 mm. Leaflets chartaceous and not shiny. Fruit slightly trilobed at the apex, with short apical horns. (Plant of non-limestone habitats.) .... *T. sphaerocarpa* var. *mirocerotis*, var. nov.

Key to *Turpinia* species in Borneo

(based mainly on reproductive characters)

The inclusion in the key of taxa for which flowering material is inadequately represented has necessitated the use of fruit characters in major divisions in the key. This has resulted in the varieties of *T. sphaerocarpa*, which otherwise are similar in flower characters, being placed apart in the key.

1a. Fruit slightly to distinctly trilobed at apex, typically with short apical horns.

2a. Flowers larger (petals 2–4 mm x 1.5–2 mm, anthers 0.8–1 mm long, pistils 2.5–3.5 mm long). Seeds larger, 5–8 mm across. Leaflets oblong, elliptic-oblong to lanceolate or ovate, typically shiny above, coriaceous, margin strongly recurved ..... *T. nitida*

2b. Flowers smaller (petals 1.8–2 mm x 1–1.1 mm, anthers 0.5 mm long, pistils 2–2.2 mm long). Seeds smaller, 2–4 mm across. Leaflets ovate-elliptic to elliptic, not shiny above, chartaceous, margin not recurved ..... *T. sphaerocarpa* var. *microcerotis*, var. nov.

1b. Fruit globose to subglobose, without short apical horns.

3a. Fruit wall very thin, brittle, 0.1–0.3 mm thick. (Plants restricted to limestone.) ..... *T. calciphila*, sp. nov.

3b. Fruit wall thin to thick, not brittle, more than 0.5 mm thick. (Plants not restricted to limestone.)

4a. Ovules few, (2–)3–4 per cell.

5a. Flowers larger (petals 2.5–4.5 mm long, stamens 2–3 mm long, pistils 2–3 mm long, ovary 1–1.5 mm across). Stipules large (14–25 mm long), conspicuous and persistent on apices of leafy twigs ..... *T. stipulacea*

5b. Flowers smaller (petals 1.2–2 mm long, stamens 0.8–1.8 mm long, pistils 1–2 mm long, ovary 0.6–1 mm across). Stipules smaller (3–8 mm long), not very conspicuous, falling off early from leafy twigs ..... *T. borneensis*

4b. Ovules many, (4–)6–8(–9) per cell.

6a. Seeds many, up to 14 per fruit. Lower surface of leaflets sparsely to densely short-hairy on the midrib, lateral veins and blade. Leaf rachises short (3–8 cm long) ..... *T. grandis*

6b. Seeds few, 1–7 per fruit. Lower surface of leaflets completely glabrous. Leaf rachises longer (10–18 cm long) ..... *T. sphaerocarpa* var. *sphaerocarpa*

The new taxa

Turpinia calciphila *J.T. Pereira* **sp. nov.** *T. sphaerocarpae Hassk. similis sed stipulis minoribus (2.5–3.5 x 2–2.5 mm), rachidibus foliorum brevioribus (1.5–4 cm longis), foliis 9–16(–25) cm longis vel brevioribus, inflorescentiis fructu brevioribus (12–15(–25) cm*

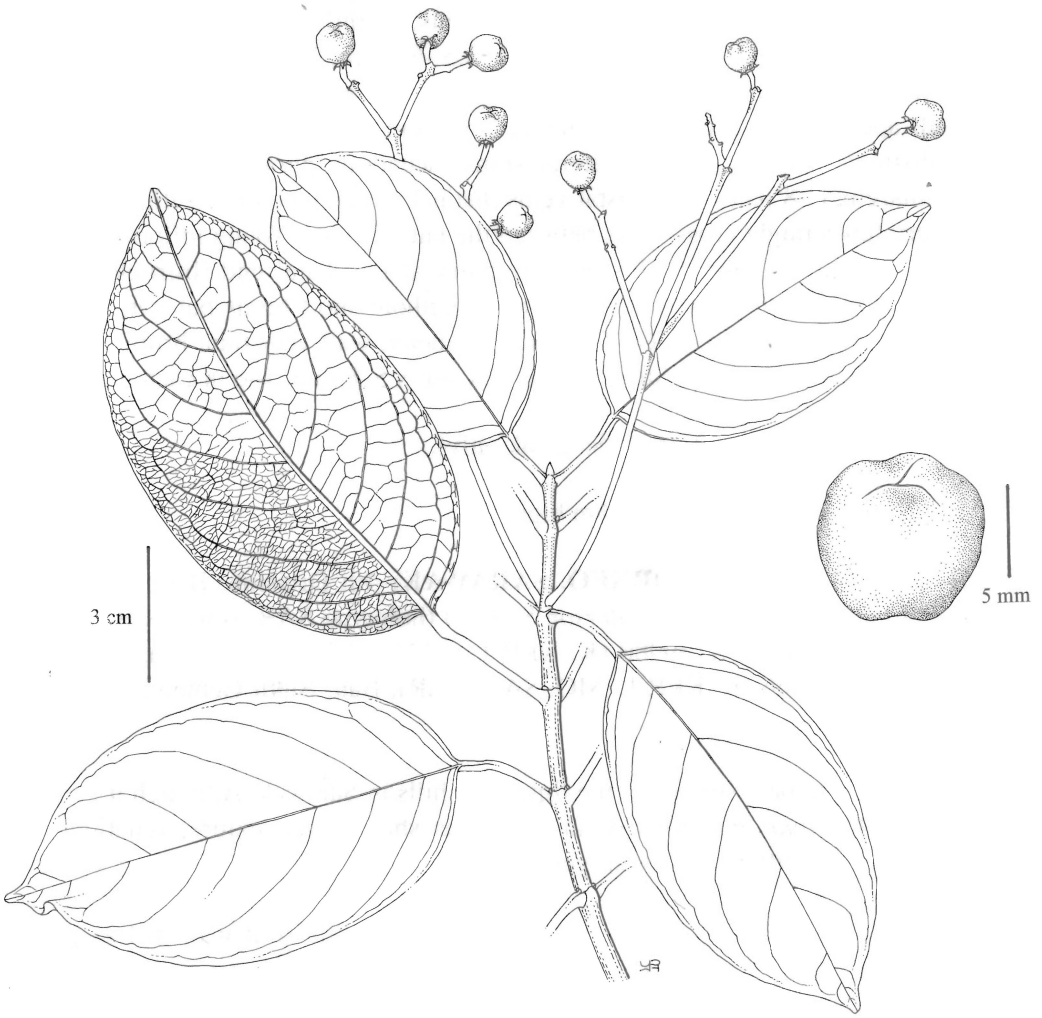

Fig. 1. *Turpinia calciphila*, fruiting branch and detail of a single fruit (from *Anderson* S. 4710).

longis), parietibus fructuum 0.1–0.3 mm crassis tenuis fragilibusque differt. Typus: Anderson S. 4710, Sarawak, Baram, Gunung Api (holotypus SAR!; isotypi BO, K, L, SING!). (Fig. 1)

Tree to 25 m tall and 50 cm diameter. Bark creamy yellow, slightly flaky. Stipules small, glabrous, 2.5–3.5 mm x 2–2.5 mm, margin hairy. Leaves 1–3-foliolate, 9–16(–25) cm long; petioles 1.5–4(–7.5) cm long, glabrous, 1–2 mm thick; leaf rachis 1.5–4 cm long, glabrous; petiolules of the lateral leaflets 5–14 mm long, glabrous; leaflets drying medium green to brown above, coriaceous, glabrous, slightly shiny on lower or both surfaces, ovate to ovate-elliptic, 6.5–15 cm x 3.5–6.5 cm; base rounded to slightly cuneate, sometimes asymmetric; margin shallowly serrate, sometimes slightly undulate, not recurved; apex shortly acuminate, acumen 0.4–1 cm long; midrib and lateral veins raised and distinct on lower surface, lateral veins ascending, parallel, open or looping towards the margin, 6–8 pairs; intercostal veins distinctly reticulate or tessellate beneath, with no or very few straight cross-veins between the lateral veins. Young inflorescence an axillary panicle, 2–3 cm long, rachis densely hairy at the distal end. Infructescences 12–15(–25) cm long. Fruit globose to subglobose, without short horns but with 3 radial lines at the apex, smooth to wrinkled, 5–10 mm diameter, wall very thin, brittle, 0.1–0.3 mm thick. Seeds dark brown to reddish brown, 4–8 mm x 5–8 mm, 1–6 in each fruit.

DISTRIBUTION. Endemic to Borneo (Sarawak only).

HABITAT. Limestone hills to about 900 m high.

SPECIMENS EXAMINED—BORNEO. SARAWAK: 4th Division, Baram, Gunung Mulu National Park, Gunung Api, *Anderson* S. 4710 (holotype SAR, isotypes BO, K, L, SING); Gunung Buda, *Chai* S. 39900 (K, KEP, L, SAN, SAR). 1st Division, near Bau, Bt. Buan, *Mamit* S. 37466 (K, KEP, L, MO, SAN, SAR); Bau, Bukit Gebung, *Chai* Tree No. 282 (SAR).

This species appears to be restricted to the limestone hills in Sarawak. Although it is most closely allied to *Turpinia sphaerocarpa* in the leaflet shape, size, texture, venation and also the fruit shape, it differs in having generally smaller stipules (2.5–3.5 mm x 2–2.5 mm), shorter leaf-rachises (1.5–4 cm long), shorter leaves (to 9–16(–25) cm long), shorter infructescences (12–15(–25) cm long), and a thinner and brittle fruit wall (0.1–0.3 mm thick). On the other hand, *T. sphaerocarpa* has larger stipules (4–6 mm x 3–5 mm long), longer leaf-rachises (10–18 cm long), longer leaves (20–46 cm long), generally longer infructescences (20–40 cm long) and a thicker fruit wall (0.5–3 mm thick). Vegetatively, it is in some characters related to *T. nitida* in having coriaceous leaflets and reticulate venation but differs in having smaller stipules, ovate-elliptic leaflets, plane (not recurved) leaflet margins and smaller, thin-walled and apically hornless fruits. *T. calciphila* is distinguishable from all other Malesian *Turpinia* species by its relatively brittle, thin-walled fruit.

There is insufficient flowering material of *T. calciphila* for comparison with the other *Turpinia* species. In spite of this, its vegetative and fruit characters are sufficiently diagnostic.

Turpinia sphaerocarpa *Hassk. var.* **microcerotis** *J. F. Pereira* **var. nov.** *T. sphaerocarpa Hassk. var. sphaerocarpae similis sed rachidibus brevioribus (2–8 cm longis), foliis brevioribus (9–18(–20) cm longis); foliolis minoribus (5–10 x 2.5–5 cm), apice fructus subtrilobato cornibus 3 brevibus instructo distinguitur. Typus: J.& M.S. Clemens 28707, Sabah, Ranau, Kinabalu, Tenompok (holotypus SING!; isotypi BO, K).* (Fig. 2)

Tree to 30 m tall and 40 cm diameter. Bark smooth, pale brown, inner bark pale brown; sapwood white to yellowish, buttresses to 3 m high. Stipules small, glabrous to sparsely hairy, 5–7 mm x 3–4 mm, margin entire to hairy. Leaves 3–5–7-foliolate, 9–18(–20) cm long; petioles 2–5 cm long, glabrous, 1–2 mm thick; leaf rachis 2–8 cm long, glabrous; petiolules of the lateral leaflets 2–10 mm long, glabrous; leaflets drying greenish brown to dark purplish brown above, chartaceous, glabrous, not shiny above, ovate-elliptic to elliptic, 5–10 cm x 2.5–5 cm; base rounded to cuneate; margin shallowly to deeply serrate, not recurved; apex shortly acuminate, acumen 0.5–1 cm long; lateral veins obscure to distinct on lower surface, ascending, open and parallel or looping towards the margin, 5–8 pairs; intercostal veins reticulate, with large areoles, obscure beneath, with no or very few straight cross-veins between the lateral veins. Inflorescence an axillary panicle, to 17 cm long, rachis sparsely hairy. Flowers with sepals ovate, thin, ciliate, 1.5–2 mm x 1–1.5 mm; petals obovate, thin, ciliate, 1.8–2 mm x 1–1.1 mm; stamens 2–2.5 mm long, filaments 1.5–2 mm long, anthers 0.5 mm long, slightly to distinctly apiculate; pistils 2–2.2 mm long, styles 1.5–2 mm long, ovary 1 mm across, 2–3-celled, each cell with 5–6–7 ovules. Infructescences to 28 cm long. Fruit slightly trilobed at the apex, with three short horns, smooth upon drying, 7–18 mm diameter, wall 1–3 mm thick. Seeds pale brown, 2–4 mm across, 2–4 in each fruit.

DISTRIBUTION. Borneo (Sabah and Kalimantan); not yet recorded for Sarawak.

HABITAT. Lowlands, on sandy loam soils, to montane forests to *c.* 1500 m high.

SPECIMENS EXAMINED—BORNEO. SABAH: Ranau, Kinabalu, Tenompok, *J. & M.S. Clemens* 28707 (holotype SING; isotypes BO, K), *Meijer* SAN 27663 (SAN); Mesilau Trail, *Sinanggol* SAN 48004 (SAN). Kota Belud, E. of Tenompok, path to Ranau, *Wood & Wyatt-Smith* A4405 (A, BRI, KEP, L, SAN, SING). **KALIMANTAN:** East Kalimantan, Central Kutei, Belahan River, G. Kelopok near Tabang, *Kostermans* 10596 (BM, CAL, CANB, K, KEP, L, LAE, NY, P, SAN, SING); near Long Bleh, *Kostermans* 10409 (A, CANB, K, L, P, PNH, SAN, SING).

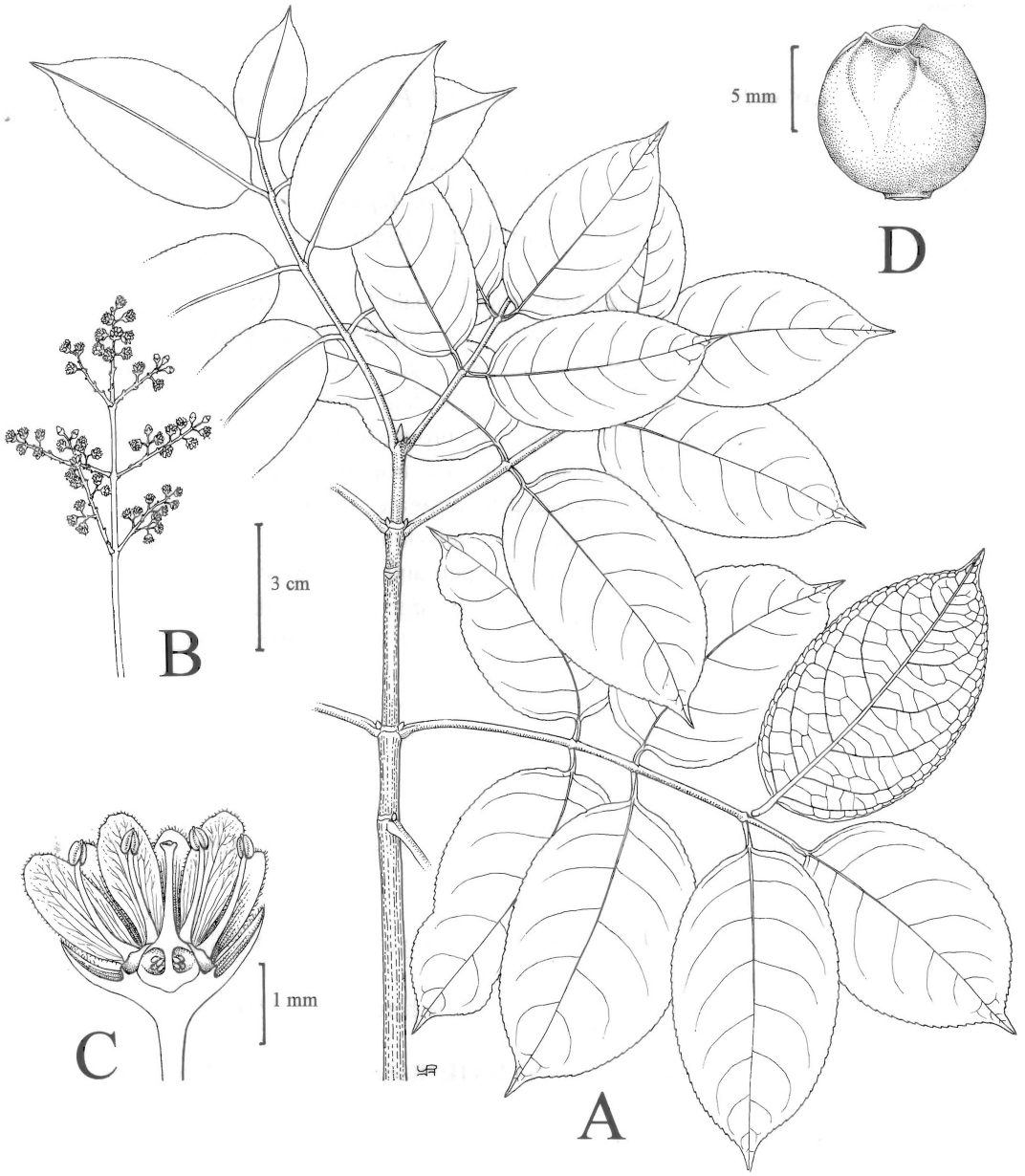

Fig. 2. *Turpinia sphaerocarpa* var. *microcerotis*. **A.** Leafy branch. **B.** Part of inflorescence. **C.** Flower, longitudinal section. **D.** Fruit. **A** and **D** from *J. & M.S. Clemens* 28707, **B** and **C** from *Kostermans* 10409.

Most of the specimens in this taxon were identified by van der Linden simply as *Turpinia sphaerocarpa*, which it no doubt resembles in floral characters. However, this new variety consistently has smaller leaflets (5–10 cm x 2.5–5 cm) and three short horn-like structures at the slightly trilobed apex of the fruit. Although *T. nitida* has horn-like fruits, it differs from *T. sphaerocarpa* var. *microcerotis* in having thickly coriaceous, typically shiny leaflets with recurved margins and larger flowers. Two extra-Bornean species, *viz.*, *T. ovalifolia* and *T. pentandra,* also bear horn-like structures on the fruits (v.d. Linden 1960), but they have larger flowers compared to *T. sphaerocarpa* var. *microcerotis*. The combination of characters mentioned and its smaller flowers are the characters which distinguish this taxon from all other Malesian *Turpinia* taxa. The specimen *Wood & Wyatt-Smith* A 4405 has deformed inflorescences which are most likely galled, but characters of the young fruit and vegetative organs fit well with other collections of this new variety.

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